

INTERNATIONAL PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C. 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year)

21 February 2000 (21.02.00)

International application No.

PCT/JP99/03189

Applicant's or agent's file reference

P20636-P0

International filing date (day/month/year)

15 June 1999 (15.06.99)

Priority date (day/month/year)

15 June 1998 (15.06.98)

Applicant

KADO, Hiroyuki et al

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

28 December 1999 (28.12.99)



in a notice effecting later election filed with the International Bureau on:

2. The election



was



was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Antonia Muller

Telephone No.: (41-22) 338.83.38

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533 Rec'd PCT/PTO 00/719134 07 DEC 2000
PRICE AND GESS

ATTORNEYS AT LAW

2100 S.E. MAIN STREET, SUITE 250

IRVINE, CALIFORNIA 92614-6238

JOSEPH W. PRICE
ALBIN H. GESS
MICHAEL J. MOFFATT
GORDON E. GRAY III
BRADLEY D. BLANCH
J. RONALD RICHEBOURG

OF COUNSEL
JAMES F. KIRK

A PROFESSIONAL CORPORATION
TELEPHONE: (949) 261-8433
FACSIMILE: (949) 261-9072
FACSIMILE: (949) 261-1726

e-mail: pgu@pgulaw.com

COPY OF PCT REQUEST

Applicant(s):

Hiroyuki Kado et al.

Title:

PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-
EMITTING CHARACTERISTICS, AND METHOD AND
APPARATUS FOR PRODUCING THE PLASMA
DISPLAY PANEL

Attorney's
Docket No.:

NAK1-BN23

"EXPRESS MAIL" MAILING
LABEL NO. EL227718303US

DATE OF DEPOSIT: December 7, 2000

PCT REQUEST

P20636-P0

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

| | | |
|---------|---|--|
| 0 | For receiving Office use only | |
| 0-1 | International Application No. | |
| 0-2 | International Filing Date | |
| 0-3 | Name of receiving Office and "PCT International Application" | |
| 0-4 | Form - PCT/RO/101 PCT Request Prepared using | PCT-EASY Version 2.84 (updated 01.06.1999) |
| 0-5 | Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty | |
| 0-6 | Receiving Office (specified by the applicant) | Japanese Patent Office (RO/JP) |
| 0-7 | Applicant's or agent's file reference | P20636-P0 |
| I | Title of invention | PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-EMITTING CHARACTERISTICS, AND METHOD AND APPARATUS FOR PRODUCING THE PLASMA DISPLAY PANEL |
| II | Applicant | |
| II-1 | This person is: | applicant only |
| II-2 | Applicant for | all designated States except US |
| II-4 | Name | MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. |
| II-5 | Address: | 1006, OazaKadoma, Kadoma-shi, Osaka 571-8501 Japan |
| II-6 | State of nationality | JP |
| II-7 | State of residence | JP |
| II-8 | Telephone No. | 06-6908-5831 |
| II-9 | Facsimile No. | 06-6906-8766 |
| III-1 | Applicant and/or inventor | |
| III-1-1 | This person is: | applicant and inventor |
| III-1-2 | Applicant for | US only |
| III-1-4 | Name (LAST, First) | KADO, Hiroyuki |
| III-1-5 | Address: | 1-15-34-107, Niitaka, Yodogawaku, Osaka-shi, Osaka 532-0033 Japan |
| III-1-6 | State of nationality | JP |
| III-1-7 | State of residence | JP |

PCT REQUEST

P20636-P0

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

| | | |
|---------|--|--|
| III-2 | Applicant and/or inventor | |
| III-2-1 | This person is: | applicant and inventor |
| III-2-2 | Applicant for | US only |
| III-2-4 | Name (LAST, First) | OHTANI, Mitsuhiro |
| III-2-5 | Address: | 3-8-31, Kouryounakamachi, Sakai-shi, Osaka 591-0024 Japan |
| III-2-6 | State of nationality | JP |
| III-2-7 | State of residence | JP |
| III-3 | Applicant and/or inventor | |
| III-3-1 | This person is: | applicant and inventor |
| III-3-2 | Applicant for | US only |
| III-3-4 | Name (LAST, First) | AOKI, Masaki |
| III-3-5 | Address: | 5-12-1, Aoshinke, Mino-shi, Osaka 562-0024 Japan |
| III-3-6 | State of nationality | JP |
| III-3-7 | State of residence | JP |
| III-4 | Applicant and/or inventor | |
| III-4-1 | This person is: | applicant and inventor |
| III-4-2 | Applicant for | US only |
| III-4-4 | Name (LAST, First) | MIYASHITA, Kanako |
| III-4-5 | Address: | 1-24-11, Saigoutoori, Moriguchi-shi, Osaka 570-0034 Japan |
| III-4-6 | State of nationality | JP |
| III-4-7 | State of residence | JP |
| IV-1 | Agent or common representative; or address for correspondence | |
| | The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: | agent |
| IV-1-1 | Name (LAST, First) | NAKAJIMA, Shiro |
| IV-1-2 | Address: | 6F, Yodogawa 5-Bankan, 2-1, Toyosaki 3-chome, Kita-ku, Osaka-shi, Osaka 531-0072 Japan |
| IV-1-3 | Telephone No. | 06-6373-3246 |
| IV-1-4 | Facsimile No. | 06-6373-3105 |
| IV-1-5 | e-mail | nakapate@cap.bekkoame.or.jp |
| V | Designation of States | |
| V-1 | Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned) | EP: DE FR GB NL |

PCT REQUEST

P20636-P0

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

| | | |
|--------|---|-------------------------------|
| V-2 | National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned) | CN KR US |
| V-5 | Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. | |
| V-6 | Exclusion(s) from precautionary designations | NONE |
| VI-1 | Priority claim of earlier national application | |
| VI-1-1 | Filing date | 15 June 1998 (15.06.1998) |
| VI-1-2 | Number | 10-166620 |
| VI-1-3 | Country | JP |
| VI-2 | Priority claim of earlier national application | |
| VI-2-1 | Filing date | 30 June 1998 (30.06.1998) |
| VI-2-2 | Number | 10-183758 |
| VI-2-3 | Country | JP |
| VI-3 | Priority claim of earlier national application | |
| VI-3-1 | Filing date | 31 July 1998 (31.07.1998) |
| VI-3-2 | Number | 10-217260 |
| VI-3-3 | Country | JP |
| VI-4 | Priority claim of earlier national application | |
| VI-4-1 | Filing date | 06 August 1998 (06.08.1998) |
| VI-4-2 | Number | 10-222987 |
| VI-4-3 | Country | JP |
| VI-5 | Priority claim of earlier national application | |
| VI-5-1 | Filing date | 17 February 1999 (17.02.1999) |
| VI-5-2 | Number | 11-039280 |
| VI-5-3 | Country | JP |
| VI-6 | Priority claim of earlier national application | |
| VI-6-1 | Filing date | 18 May 1999 (18.05.1999) |
| VI-6-2 | Number | 11-137763 |
| VI-6-3 | Country | JP |

PCT REQUEST

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

P20636-P0

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|---------|---|--|-----------------------------|
| VI-7 | Priority claim of earlier national application | | |
| VI-7-1 | Filing date | 18 May 1999 (18.05.1999) | |
| VI-7-2 | Number | 11-137764 | |
| VI-7-3 | Country | JP | |
| VI-8 | Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): | VI-1, VI-2, VI-3, VI-4, VI-5, VI-6, VI-7 | |
| VII-1 | International Searching Authority Chosen | European Patent Office (EPO) (ISA/EP) | |
| VIII | Check list | number of sheets | electronic file(s) attached |
| VIII-1 | Request | 5 | - |
| VIII-2 | Description | 108 | - |
| VIII-3 | Claims | 40 | - |
| VIII-4 | Abstract | 1 | pct-55..txt |
| VIII-5 | Drawings | 29 | - |
| VIII-7 | TOTAL | 183 | |
| VIII-8 | Accompanying items | paper document(s) attached | electronic file(s) attached |
| VIII-9 | Fee calculation sheet | ✓ | - |
| VIII-10 | Separate signed power of attorney | ✓ | - |
| VIII-10 | Copy of general power of attorney | ✓ | - |
| VIII-16 | PCT-EASY diskette | - | diskette |
| VIII-17 | Other (specified): | Request for transmittal of priority document | - |
| VIII-18 | Figure of the drawings which should accompany the abstract | 4 | |
| VIII-19 | Language of filing of the international application | English | |
| IX-1 | Signature of applicant or agent | | |
| IX-1-1 | Name (LAST, First) | NAKAJIMA, Shiro <i>Shiro Nakajima</i> | |

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|--------|---|--------|
| 10-1 | Date of actual receipt of the purported international application | |
| 10-2 | Drawings: | |
| 10-2-1 | Received | |
| 10-2-2 | Not received | |
| 10-3 | Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application | |
| 10-4 | Date of timely receipt of the required corrections under PCT Article 11(2) | |
| 10-5 | International Searching Authority | ISA/EP |

PCT REQUEST

P20636-P0

Original (for SUBMISSION) - printed on 14.06.1999 06:30:48 PM

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| 10-6 | Transmittal of search copy delayed until search fee is paid | |
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| 11-1 | Date of receipt of the record copy by the International Bureau | |
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INTERNATIONAL COOPERATION TREATY

PCT

REC'D 28 SEP 2000

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | | |
|---|---|--|
| Applicant's or agent's file reference P20636-P0 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No PCT/JP99/03189 | International filing date (day/month/year) 15/06/1999 | Priority date (day/month/year) 15/06/1998 |
| International Patent Classification (IPC) or national classification and IPC H01J17/49 | | |
| Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 8 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 31 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

| | |
|---|---|
| Date of submission of the demand 28/12/1999 | Date of completion of this report 26.09.2000 |
| Name and mailing address of the international preliminary examining authority  European Patent Office D-80298 Munich Tel +49 89 2399 - 0 Tx 523656 epmu d Fax +49 89 2399 - 4465 | Authorized officer Centmayer, F Telephone No +49 89 2399 2167 |



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP99/03189

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

| | | | |
|------------------------|---------------------|---------------------------|------------|
| 2,4,8-108 | as originally filed | | |
| 1,1a,3,3a,5,6,6a, 7 | as received on | 21/06/2000 with letter of | 21/06/2000 |

Claims, No.:

| | | | |
|---|----------------|---------------------------|------------|
| 5-10,12,13,16,17, 22-27,29-52,57-60, 63-65,70,73,78,80, 82,83,99, 109-111 | as received on | 21/06/2000 with letter of | 21/06/2000 |
|---|----------------|---------------------------|------------|

Drawings, sheets:

| | |
|------------|---------------------|
| 1/29-29/29 | as originally filed |
|------------|---------------------|

2. The amendments have resulted in the cancellation of:

- | | | |
|---|---------|---|
| <input type="checkbox"/> the description. | pages: | |
| <input checked="" type="checkbox"/> the claims. | Nos.: | 1-4,11,14,15,18-21,28,53-56,61,62,66-69,71,72,74-77,79,81,84-98,100 -108 |
| <input type="checkbox"/> the drawings. | sheets: | |

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

see separate sheet

4. Additional observations, if necessary:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP99/03189

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☒ claims Nos. 24-27, 30-60, 66-92, 99-101, 103, 104, 109-111.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos. .

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/JP99/03189

☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

☐ all parts.

☒ the parts relating to claims Nos. 1-111 as originally filed.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|------------------------------------|
| Novelty (N) | Yes: | Claims | 1-23,28,29,61-65,93-98,102,105-108 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | |
| | No: | Claims | 1-23,28,29,61-65,93-98,102,105-108 |
| Industrial applicability (IA) | Yes: | Claims | 1-23,28,29,61-65,93-98,102,105-108 |
| | No: | Claims | |

2. Citations and explanations

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP99/03189

Reference is made to the following documents:

D1: EP-A-0 554 172

D2: JP-A-02 018 834

Re Item I

Basis of the report

The common concept of the claims as originally filed is the use of a dry gas. This feature has been omitted in some of the claims as amended. It appears that the original documents only disclose a PDP production method in which a dry gas is used, and a PDP which was produced by this method. Moreover only a method in which a dry gas is used, and a PDP which was produced by this method have been searched for.

The Report is therefore based not on the claims as amended but on claims 1-111 as originally filed.

Re Item VIII

Certain observations on the international application

1. Although claims 1,3-5,8-12 and 93,95 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP99/03189

which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Not all claims which include all the features of any other claim contain a reference to the other claim and then state the additional features which it is desired to protect (Rule 6.4a PCT).

Hence, claims 1,3-5, 8-12 and 93,95 do not meet the requirements of Art. 6 PCT.

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

See Item VIII

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. D1 (see in particular the places indicated in the Search Report) describes a plasma display panel (PDP) production method comprising :
a fluorescent substance application step for applying fluorescent substances to at least one of: a side of a front panel facing a back panel; and a side of the back panel facing the front panel; and a heating step for heating either or both of the front panel and the back panel to which the fluorescent substances have been applied.

The problem to be solved by the present invention may be regarded as providing

a method for the production of a PDP which has high light-emitting efficiency and good colour reproduction (see page 4, lines 19-21 of the description).

D2 describes a production method for a display device comprising :
a fluorescent substance application step for applying fluorescent substances to the inner side of a front panel and
a heating step for heating the front panel to which the fluorescent substances have been applied, wherein
the heating step is performed while the applied fluorescent substances are in contact with a dry gas.

It was therefore obvious for a person skilled in the art to bring, in the heating step of the method of D1, the fluorescent substances in contact with a dry gas.

The method according to claim 1 does therefore not involve an inventive step (Art. 33 (3) PCT).

2. Claims 2-9, 11-23, 28, 29 and 61-64 do not appear to contain any features which, in combination with the features of claim 1 meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

A person skilled in the art would always try use one heating step for all process steps which need heating and he would use dry air for drying also materials other than fluorescent substances. a person skilled in the art would choose the conditions as necessary for the various process steps.

3. Since the production method is obvious, this is also true for the PDP produced in accordance with this method. Therefore the PDP according to claim 65 does also not involve an inventive step (Art. 33 (3) PCT).

4. In order to carry out the method according to the method claims, a person skilled in the art would provide an apparatus with the features of claims 93 or 95. Within his normal skill he can also provide the features of claims 94, 97, 98, 102 and 105-108.

The apparatus according to claims 93-98, 102 and 105-108 does therefore also not involve an inventive step (Art. 33 (3) PCT).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/JP99/03189

5. Claim 10 does not comprise a fluorescent substance application step. It cannot be understood which problem is solved by the method according to claim 10 (Rule 5.1iii PCT). The method according to claim 10 can certainly not contribute to the solution of the above technical problem.
Therefore the method according to claim 10 does not involve an inventive step (Art. 33 (3) PCT).

Re Item IV

Lack of unity of invention

The claims as amended do not relate to subject-matter which is so linked as to form a common inventive concept (Rule 13 (1) PCT) because the feature "dry gas" which was the "special technical feature" (Rule 13 (2) PCT) was omitted from some of the claims.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|---|---|--|
| Applicant's or agent's file reference P20636-P0 | FOR FURTHER ACTION <small>see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</small> | |
| International application No. PCT/JP 99/ 03189 | International filing date (day/month/year) 15/06/1999 | (Earliest) Priority Date (day/month/year) 15/06/1998 |
| Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al. | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.
☒ It is also accompanied by a copy of each prior art document cited in this report

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☒ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No

- ☐ as suggested by the applicant.
- ☐ because the applicant failed to suggest a figure.
- ☒ because this figure better characterizes the invention
- 3
☐ None of the figures

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP 99/03189

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos. :
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos. : 24--27, 30-60, 66-92, 96, 99-101, 103, 104, 109-111
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos. :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 24--27,30-60,66-92,96,99-101,103,104,109-111

In view of the large number and also the wording of the claims presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the clarity and conciseness requirements of Article 6 PCT (see also Rule 6.1(a) PCT) to such an extent that a meaningful search is impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear and sufficiently concise, namely claims 1-23, 28,29,61-64,93-95,97,98,102,105-108.

These claims, although not worded as required by Rule 6.4 PCT, have in common that a dry gas is used at least in one production step.

It is possible that the application comprises more than one invention/group of inventions (Rule 13 PCT).

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/03189

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H01J17/49 H01J9/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| Y | EP 0 554 172 A (FUJITSU LTD) 4 August 1993 (1993-08-04) see abstract column 25, line 44-56 --- | 1,2 |
| Y | PATENT ABSTRACTS OF JAPAN vol. 014, no. 161 (E-0909), 28 March 1990 (1990-03-28) & JP 02 018834 A (NEC KANSAI LTD), 23 January 1990 (1990-01-23) abstract --- -/- | 1,2 |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

9 November 1999

Date of mailing of the international search report

19. 11. 99

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Centmayer, F

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/03189

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | PATENT ABSTRACTS OF JAPAN vol. 018, no. 167 (E-1528), 22 March 1994 (1994-03-22) & JP 05 342991 A (FUJITSU LTD), 24 December 1993 (1993-12-24) cited in the application abstract ----- | |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 99/03189

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| EP 0554172 A | 04-08-1993 | JP 2731480 B | 25-03-1998 |
| | | JP 5205642 A | 13-08-1993 |
| | | JP 5290721 A | 05-11-1993 |
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| | | DE 69318196 D | 04-06-1998 |
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| | | US 5674553 A | 07-10-1997 |
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| JP 05342991 A | 24-12-1993 | NONE | |

29

DESCRIPTION

PLASMA DISPLAY PANEL WITH SUPERIOR LIGHT-EMITTING
CHARACTERISTICS, AND METHOD AND APPARATUS FOR
PRODUCING THE PLASMA DISPLAY PANEL

5 FIELD OF THE INVENTION

This invention relates to a plasma display panel used as a display for a color television receiver or the like, and also relates to a method of producing the plasma display panel.

10 BACKGROUND OF THE INVENTION

Recently, Plasma Display Panel (PDP) has received attention as a large-scale, thin, lightweight display for use in computers and televisions, and the demand for high-definition PDPs has also increased.

15 FIG. 29 is a sectional view showing a general AC-type PDP.

In the drawing, a front glass substrate 101 is covered by a stack of display electrodes 102, a dielectric glass layer 103, and a dielectric protecting layer 104 in the order, where
20 the dielectric protecting layer 104 is made of magnesium oxide (MgO) (see, for example, Japanese Laid-Open Patent Application No.5-342991.

Address electrodes 106 and partition walls 107 are formed on a back glass substrate 105. Fluorescent substance layers 110 to 112 of respective colors (red, green, and blue) are formed in space between the partition walls 107.

5 The front glass substrate 101 is laid on the partition walls 107 on the back glass substrate 105 to form space. A discharge gas is charged into the space to form discharge spaces 109.

 In the above PDP with such a construction, vacuum
10 ultraviolet rays (their wavelength is mainly at 147nm) are emitted as electric discharges occur in the discharge spaces 109. The fluorescent substance layers 110 to 112 of each color are excited by the emitted vacuum ultraviolet rays, resulting in color display.

15 The above PDP is manufactured in accordance with the following procedures.

 The display electrodes 102 are produced by applying silver paste to the surface of the front glass substrate 101, and baking the applied silver paste. The dielectric glass layer
20 103 is formed by applying a dielectric glass paste to the surface of the layers, and baking the applied dielectric glass paste. The protecting layer 104 is then formed on the dielectric glass layer 103.

 The address electrodes 22 are produced by applying
25 silver paste to the surface of the back glass substrate 105, and

baking the applied silver paste. The partition walls 107 are formed by applying the glass paste to the surface of the layers in stripes with a certain pitch, and baking the applied glass paste. The fluorescent substance layers 110 to 112 are formed
5 by applying fluorescent substance pastes of each color to the space between the partition walls, and baking the applied pastes at around 500°C to remove resin and other elements from the pastes.

After the fluorescent substances are baked, a sealing
10 glass frit is applied to an outer region of the back glass substrate 105, then the applied sealing glass frit is baked at around 350°C to remove resin and other elements from the applied sealing glass frit. (Frit Temporary Baking Process)

The front glass substrate 101 and the back glass
15 substrate 105 are then put together so that the display electrodes 102 are perpendicular to the address electrodes 106, the electrodes 102 facing the electrodes 106. The substrates are then bonded by heating them to a temperature (around 450°C) higher than the softening point of the sealing glass. (Bonding
20 Process)

The bonded panel is heated to around 350°C while gases are exhausted from inner space between the substrates (space formed between the front and back substrates, where the fluorescent substances are in contact with the space)
25 (Exhausting Process). After the exhausting process is

that the production cost is reduced.

The above first object is achieved by setting the color temperature of light to 7,000K or more, more preferably to 8,000K or more, 9,000K or more, or 10,000K or more when the
5 light is emitted from all the cells.

To increase the color temperature in the white balance, it is important to improve the chromaticity of light emitted from blue fluorescent substance layers. This is achieved by setting the chromaticity coordinate y (the CIE color
10 specification) of light to 0.08 or less, more preferably to 0.07 or less, or 0.06 or less when the light is emitted from only the blue cells or when vacuum ultraviolet rays are radiated onto the blue cells to excite the blue fluorescent substances. Alternatively, this is achieved by setting the peak wavelength
15 of a spectrum of light to 455nm or less, more preferably to 453nm or less, or 451nm or less when the light is emitted from the blue cells when light is emitted from only the blue cells.

The color reproduction is also improved when the chromaticity of light emitted from blue fluorescent substance
20 layers is improved.

The above PDP with improved chromaticity of light emitted from blue fluorescent substance layers is manufactured by a PDP production method in which the processes for heating the fluorescent substances (e.g., the fluorescent substance
25 baking process, sealing material temporary baking process,

bonding process, and exhausting process) are performed in the dry gas atmosphere, or in an atmosphere in which a dry gas is circulated at a pressure lower than the atmospheric pressure.

The inventors of the present invention found in the manufacturing procedure in accordance with conventional PDP production methods that the blue fluorescent substances are degraded by heat when the fluorescent substances are heated in the processes and that the degradation leads to reduction in the light-emitting intensity and the chromaticity of emitted light. The inventors have provided the above PDP production method of the present invention and made it possible to prevent blue fluorescent substances from being degraded by heat.

Here, the "dry gas" indicates a gas containing steam vapor with lower partial pressure than the typical partial pressure. It is preferable to use an air processed to be dried (dry air).

It is desirable that the partial pressure of the steam vapor in the dry gas atmosphere is set to 15Torr or less, more preferably to 10Torr or less, 5Torr or less, 1Torr or less, 0.1Torr or less. It is desirable that the dew-point temperature of the dry gas is set to 20°C or lower, more preferably to 10°C or lower, 0°C or lower, -20°C or lower, -40°C or lower.

The above PDP with improved chromaticity of light emitted from blue fluorescent substance layers is also manufactured by a PDP production method in which: the front and

back panels are temporarily baked while a space is opened between their facing sides; the front and back panels are bonded while a dry gas is circulated in an inner space between the panels; or the front and back panels are bonded together after
5 preparatively heated while a space is opened between their facing sides.

Both of the first and second objects of the present invention are achieved by: a method in which after the front panel and the back panel are bonded together by a sealing
10 material in between by maintaining a bonding temperature, the exhausting process is started while the panels are not cooled from the bonding temperature to room temperature, and gases are exhausted from the inner space between the panels; or a method in which after the front panel and the back panel with a sealing
15 material in between are temporarily baked by maintaining a temporary bonding temperature, then the bonding process is started while the panels are not cooled from the temporary bonding temperature to room temperature.

In the actual manufacturing procedure, each of such
20 heating processes is performed using a heating furnace. Conventionally, the sealing material temporary baking process, the bonding process, and the exhausting process are separately performed, and the panels are cooled to room temperature at each interval between processes. With such a construction, it
25 requires a long time and consumes much energy for the panels to